

Swift Observation of GRB 070714B

J. Racusin (PSU), L. Barbier (GSFC), and W. Landsman (GSFC) for the Swift Team

1 Introduction

BAT triggered on GRB 070714 at 04:59:29 UT (Trigger 284856) (Racusin, *et al.*, *GCN Circ.* 6620). This was a rate-trigger on a short-hard burst with soft extended emission with $T_{90} = 64 \pm 5$ sec. Swift slewed to this burst immediately and XRT began follow-up observations at $T + 61$ sec, and UVOT at $T + 70$ sec. Our best position is the astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA($J2000$) = $57.84287deg$ (03h51m22.29s), Dec($J2000$) = $+28.29782deg$ ($+28d17'52.2''$) with an error of 1.8 arcsec (90% confidence, radius, including boresight uncertainties).

2 BAT Observation and Analysis

Using the data set from $T - 120$ to $T + 182$ sec, further analysis of BAT GRB 070714B has been performed by Swift team (Barbier, *et al.*, *GCN Circ.* 6623). The BAT ground-calculated position is RA($J2000$) = $57.853deg$ (3h51m24.8s), Dec($J2000$) = $+28.294deg$ ($+28d17'37''$) ± 1.4 arcmin, (radius, systematic and statistical, 90% containment). The partial coding was 93%.

The BAT mask-weighted light curves (Fig.1) show multiple short spikes starting from $T - 0.8$ sec with a duration of 3 sec. There is extended softer emission from $T + 20$ sec to $T + 70$ (and possibly $T + 100$) sec. $T_{90}(15 - 350keV)$ is 64 ± 5 sec (estimated error including systematics). The light curve looks similar to previous short bursts such as GRB 050724 with a short-hard initial episode followed by a softer extended episode, so we think it is likely that this burst is in the short category. This is also suggested by the spectral lag measurements (Norris *et al.*, *GCN Circ.* 6631).

The time-averaged spectrum from $T - 0.8$ to $T + 65.6$ sec is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.36 ± 0.19 . The fluence in the 15 – 150 keV band is $7.2 \pm 0.9 \times 10^{-7}$ ergs/cm². The 1-sec peak photon flux measured from $T - 0.39$ sec in the 15 – 150 keV band is 2.7 ± 0.2 ph/cm²/sec. Separating out the initial "spike" of emission (from $T - 0.8$ to $T + 2$ sec), the photon index in a simple power-law fit is 0.99 ± 0.08 . The fluence in the 15 – 150 keV band of this part is $5.1 \pm 0.3 \times 10^{-7}$ ergs/cm². All the quoted errors are at the 90% confidence level.

3 XRT Observations and Analysis

Using 770 sec of overlapping XRT Photon Counting mode and UVOT V-band data of GRB 070714B (Racusin *et al.*, *GCN Circ.* 6620), we find an astrometrically corrected X-ray position (using the XRT-UVOT alignment and matching UVOT field sources to the USNO-B1 catalogue): RA($J2000$) = $57.84287deg$ (03h51m22.29s), Dec($J2000$) = $+28.29782deg$ ($+28d17'52.2''$) with an uncertainty of 1.8 arcsec (90% confidence radius). This position is within 2.5 arcsec of the initial XRT position, 35 arcsec from the refined BAT position (Barbier *et al.*, *GCN Circ.* 6623), and 1.4 arcsec from the Liverpool optical afterglow candidate (Melandri *et al.*, *GCN Circ.* 6621).

The 0.3 – 10 keV light curve (Fig. 2) shows a fading behavior with super-imposed small flaring. The light curve can be fit with a power-law beginning with a steep decay with a slope of 2.49 ± 0.18 followed by a plateau beginning at 413 ± 50 sec with a slope of 0.60 ± 0.29 until another break at 1187 ± 270 sec with a decay of 1.73 ± 0.11 .

The X-ray PC and WT spectrum is well fit by an absorbed power law with a photon index for 1.2 ± 0.1 and a column density of $13 \pm 3 \times 10^{20}$ cm⁻² in excess of the galactic value (6.4×10^{20} cm⁻²). The

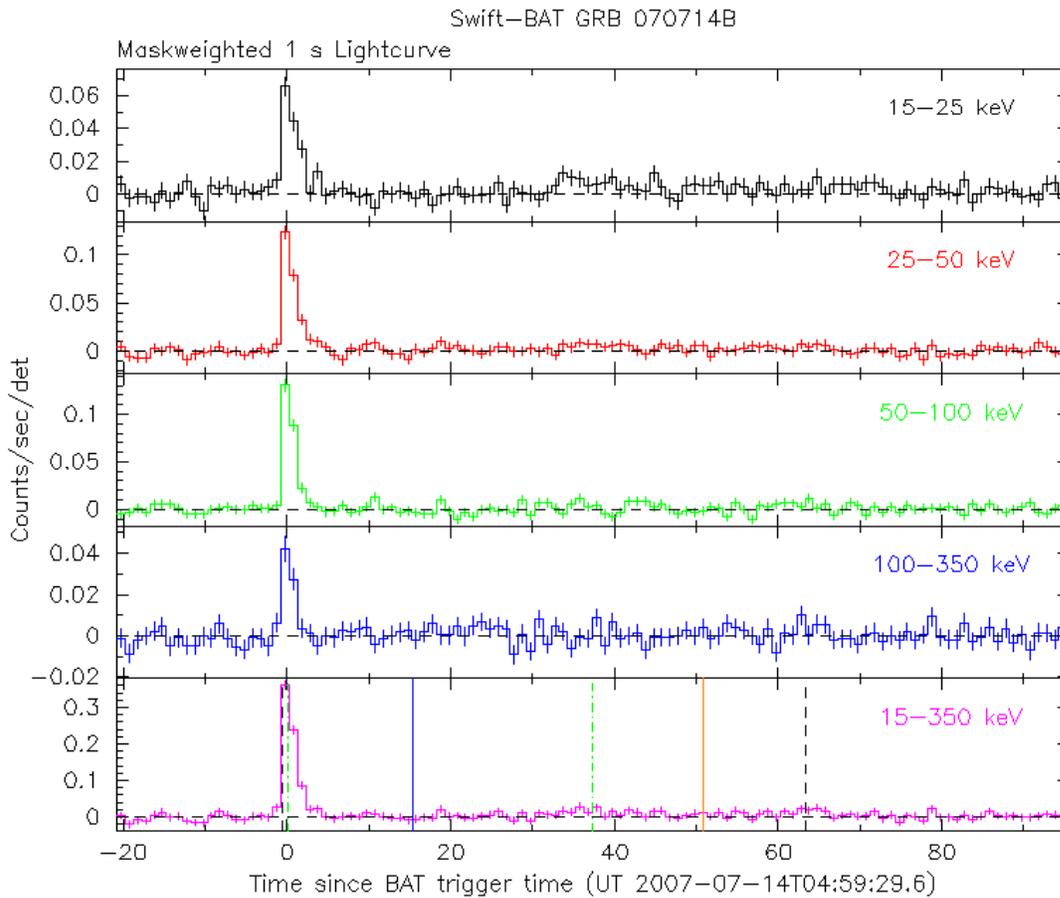


Figure 1: BAT Light curve. The mask-weighted light curve in the 4 individual plus total energy bands. The units are counts/sec/illuminated-detector and T_0 is 04:59:29.6 UT.

absorbed (unabsorbed) 0.3–10.0 keV flux of the WT spectrum is 9.2×10^{-10} (1.0×10^{-9}) $\text{erg cm}^{-2} \text{s}^{-1}$ and the flux of the PC spectrum is 3.4×10^{-12} (3.7×10^{-12}) $\text{ergs cm}^{-2} \text{s}^{-1}$.

4 UVOT Observation and Analysis

The UVOT began observing the field of GRB 070714B at 05:00:40 UT, 70.4 sec after the initial BAT trigger (Landsman *et al.*, *GCN Circ.* 6632). No new source was detected within the XRT error circle in any of the UVOT observations. Upper limits are summarized in Table 1. These upper limits are not corrected for Galactic extinction $E(B-V) = 0.14$.

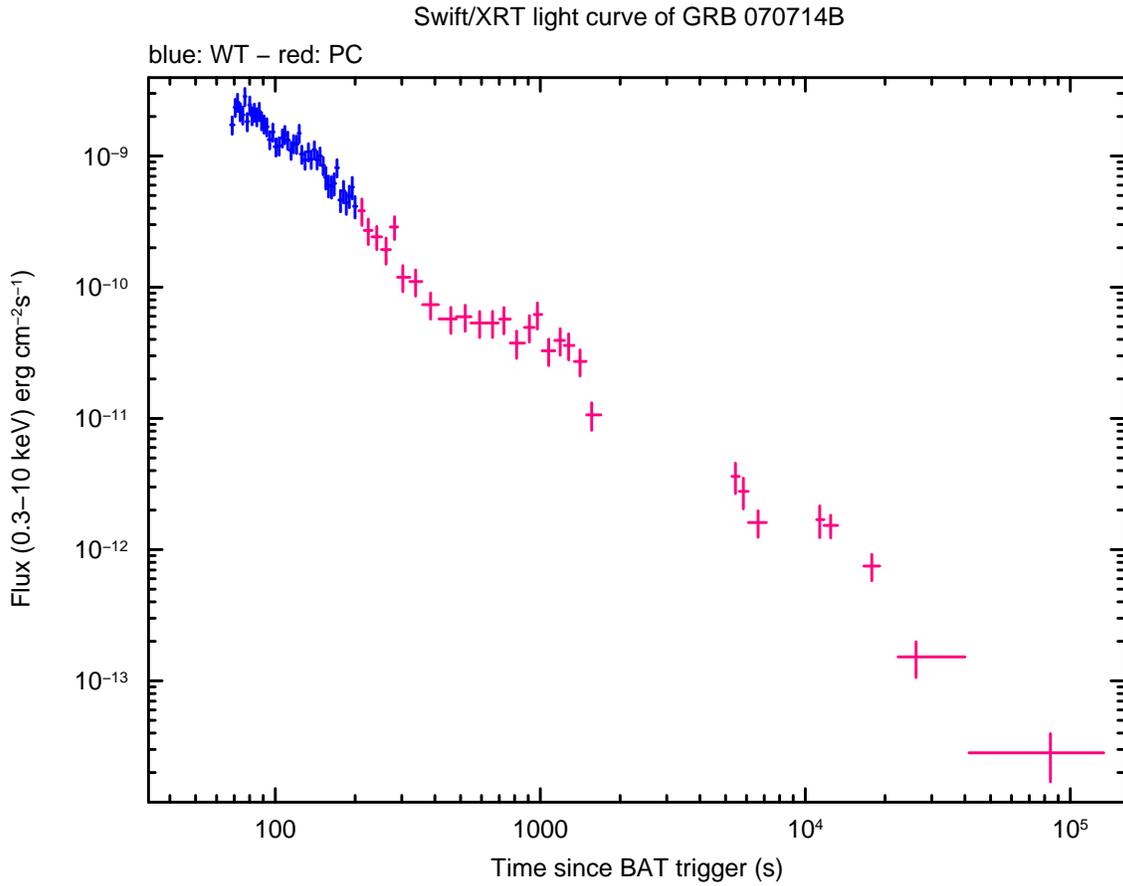


Figure 2: XRT Lightcurve. Flux ($\text{erg/cm}^2/\text{sec}$) in the 0.3–10 keV band: Window Timing mode (blue), Photon Counting mode (red). The approximate conversion is 1 count/sec = $\sim 7.2 \times 10^{-11} \text{ ergs/cm}^2/\text{sec}$.

Filter	Start	Stop	Exposure(s)	3-Sigma UL
White	70	170	98.2	20.4
V	177	577	393.4	19.6
B	657	1637	58.1	19.2
U	632	1766	89.2	19.2
UVW1	607	1750	97.3	19.1
UVW2	687	1676	77.8	19.2

Table 1: Magnitude limits from UVOT observations